

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594
AIRCRAFT ACCIDENT REPORT**

UNCONTROLLED COLLISION WITH TERRAIN

**AMERICAN INTERNATIONAL AIRWAYS FLIGHT 808
DOUGLAS DC-8-61, N814CK
U.S. NAVAL AIR STATION
GUANTANAMO BAY, CUBA
AUGUST 18, 1993**

1. FACTUAL INFORMATION

1.1 History of Flight

On August 18, 1993, at 1656 eastern daylight time (EDT), a Douglas DC-8-61 freighter, N814CK, registered to American International Airways (AIA), Inc., d/b/a Connie Kalitta Services, Inc., and operating as AIA flight 808, collided with level terrain approximately 1/4 mile from the approach end of runway 10, after the captain lost control of the airplane while approaching the Leeward Point Airfield at the U.S. Naval Air Station (NAS), Guantanamo Bay, Cuba. The airplane was destroyed by impact forces and a postaccident fire, and the three flight crewmembers sustained serious injuries. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan had been filed. The flight was conducted under 14 Code of Federal Regulations (CFR), Part 121, Supplemental Air Carriers, as an international, nonscheduled, military contract flight.

The captain and first officer had originated their 4-day sequence¹ of flights in Atlanta, Georgia (ATL), at 2300 (start of duty day) on August 16. Flight 860, a DC-8-61, N814CK, had departed Atlanta at 0006, on August 17, destined for Ypsilanti, Michigan (YIP), after an intermediate stop in Charlotte, North Carolina (CLT). The flight arrived in Ypsilanti at 0408, whereby the flight engineer concluded his sequence and was replaced by the flight engineer involved in the accident.

¹Preassigned schedule of destinations to be flown for the 4-day period.

The flight sequence continued with a change of airplane and the departure of flight 841, a DC-8-54, N802CK, from Ypsilanti to St. Louis, Missouri (STL), at 0746, and terminated at Dallas-Ft. Worth International Airport (DFW), Texas, whereby the flightcrew ended their duty day at 1200. The captain and first officer had been on duty for 13 hours, of which 5.6 hours was flight time; and the flight engineer had been on duty for 7 hours, of which 3 hours was flight time. The company provided a hotel room at the DFW Airport and the crew was relieved of flight duty for a rest period of 11 hours.

The flightcrew met in the hotel lobby in the evening hours of August 17, and arrived at the airport to begin their duty day at 2300. The scheduled flight sequence began with the departure of flight 840 from DFW at 2400, and proceeded to YIP, with an intermediate stop in STL. Flight 840 arrived at YIP at 0325 on August 18. The flightcrew changed airplanes to N814CK, and, after the "freight sort" had been completed, flight 861 departed YIP at 0620 for ATL. Upon arrival in Atlanta at 0752, the flightcrew was relieved of flight duty until their next scheduled sequence was to begin at 2300.

Shortly after 0800, the captain, domiciled in Atlanta, departed for his residence, while the first officer remained at the airport to visit with his family. The company provided the flight engineer with hotel accommodations for his scheduled rest period. The captain stated that he had telephoned his wife at their home when he stopped en route at an automotive store and was told that the "company" needed him back at the airport immediately to fly an unexpected trip. The first officer and flight engineer were also notified by the company and rejoined the captain at the Atlanta airport.

According to the chief crew scheduler for AIA, the original airplane and flightcrew, N808CK, which was to operate as flight 808, from Miami, Florida, to the Naval Air Station, Norfolk, Virginia, and on to Guantanamo Bay, had been canceled due to mechanical problems. The accident crew was reassigned to fly N814CK to Norfolk, load freight, deliver the freight to Guantanamo, and then ferry the empty airplane back to Atlanta. According to the crew scheduler, during his testimony at the Safety Board's public hearing on this accident, the revised flight assignment would have resulted in an accumulated flight time of 12 hours, and would have been accomplished within the company's "24-hour crew duty day policy."

N814CK departed Atlanta at 1010 that same day and arrived at Norfolk at 1140. Upon arrival, the captain exchanged greetings with the freight handler and then proceeded to the station office to obtain a revised flight plan from the company flight follower. The airplane remained on the ground for approximately 2 1/2 hours while the freight was loaded. During this time, the freight handler offered the flightcrew his vehicle to use while the airplane was being loaded. He accompanied the crew in the vehicle and observed them reviewing the flight plan, weight and balance information, and the weather. Additionally, the flightcrew reviewed the arrival and landing procedures for Guantanamo Bay, including the approach to runway 10, since none of the crewmembers had ever landed a DC-8 at Leeward Point Airfield.

Upon completion of the freight loading and the incidental duties associated with the dispatch of the airplane, the captain assumed the duties of the flying pilot while the first officer performed the radio communications. Flight 808 taxied from the cargo ramp at 1405 and departed Norfolk at 1413. The captain stated that the airplane had performed satisfactorily during the en route portion of the flight and that the arrival into the terminal area at Guantanamo Bay was uneventful.

According to information derived from the recorded air traffic control communications and the cockpit voice recorder (CVR),² the first officer established radio contact with the Guantanamo radar controller at 1634:49, while the flight was descending out of 32,000 feet (flight level (FL) 320). Several radio transmissions were exchanged between the first officer and the controller during a 3-minute period. The controller radioed, "Connie 808 heavy, Guantanamo radar, maintain VFR [visual flight rules] one two miles off the Cuban coast; no reported traffic in the area; report East Point; Leeward Field landing runway one zero; wind, one eight zero at eight; altimeter is two niner niner seven." The first officer acknowledged the transmission and stated, "...we'd like to land [runway] two eight." The controller responded and issued further landing instructions, which included a report of crossing the East Point³ fix. However, the flightcrew was confused about the identification and location of the East Point fix, and the first officer requested clarification. Flight 808 crossed the East Point fix at approximately 1638, while at FL220.

²A full transcript of the CVR is contained in appendix B.

³East Point is the first of three position fixes identified by radials from the Guantanamo Very High Frequency Omni Directional Radio Range (VOR).

At 1641:53, the CVR recorded the captain stating to the other crewmembers, "otta make that one zero approach just for the heck of it to see how it is; why don't we do that let's tell 'em we'll take [runway] one zero; if we miss we'll just come back around and land on two eight." This was followed by the first officer contacting the Guantanamo radar controller and requesting the approach to runway one zero. At 1642:48, the controller acknowledged the request and asked, "...you want uh, left entry or right entry." The first officer responded, "make a right entry...." The captain and first officer engaged in a discussion concerning the authorized entry pattern for the approach to runway one zero. The captain said, "it does say right traffic in the, in that uh, training clip that's all it says." The first officer followed with the comment, "right, I know for sure uh, 'cause I just went through recurrent.---- besides there's a big hill over there; it might give you some -- depth perception problems."

At 1645:51, the control of flight 808 was transferred from the radar controller to the Guantanamo tower controller. The first officer made initial contact with the tower several seconds later, and, at 1646:07, the controller stated, "...runway one zero, wind two zero zero at seven, altimeter two niner niner seven, report Point Alpha." The first officer acknowledged the transmission and requested "clarification" of the location of Point Alpha. The controller provided the crew with the information and followed this transmission several seconds later with, "eight zero eight, would you like runway two eight." The first officer responded, "we're gonna try ten first...."

At 1646:41, the captain began the approach sequence, calling for the flaps to be set at 15 degrees and the approach checklist items to be performed. The flight continued toward Guantanamo Bay, and, at 1651:37, the first officer remarked to the captain, "you wanna get all dirty and slowed down and everything." The captain acknowledged the comment. At 1652:03, the tower controller transmitted, "Connie eight oh eight, Cuban airspace begins three quarters of a mile west of the runway. You are required to remain with this, within the airspace designated by a strobe light."⁴ The first officer responded, "roger, we'll look for the strobe light...." Several seconds later, the first officer again remarked to the captain, "I'd give myself plenty of time to get straight...maintain a little water off because you're gonna have

⁴The strobe is a high intensity flashing light mounted on the Marine Corps guard tower, located at the corner of the Cuban border and the shoreline. There is only one strobe and it is used as a visual aide to identify the location of the fence. On the day of the accident, the strobe light was not operational and was in the process of repair.

to turn...I think you're gettin' in close before you start your turn." The captain responded, "yeah, I got it, I got it...going to have to really honk it, let's get the gear down."

During the next several seconds, the CVR recorded the captain stating to the other crewmembers that he was having difficulty identifying the runway environment as they approached the airport and as the wing flaps were being lowered to the 50-degree down position. The captain then said, "now we gotta stay on uh one side of this road here, right." The first officer responded, "yeah, we gotta stay on this side, on this side over here, you can see the strobe lights."

At 1652:22, the flight engineer remarked to the captain, "slow airspeed." This was followed by, "check the turn," from the first officer.

The following exchange of conversation was recorded by the CVR:

1653:28	Captain	where's the strobe
1653:29	Flight Engineer	right over there
1653:31	Captain	where
1653:33	First Officer	right inside there, right inside there
1653:35	Flight Engineer	you know, we're not getting our airspeed back there
1653:37	Captain	where's the strobe
1653:37	First Officer	right down there
1653:41	Captain	I still don't see it
1653:42	Flight Engineer	# we're never goin' to make this
1653:45	Captain	where do you see a strobe light
1653:48	First Officer	right over here
1653:57	Captain	where's the strobe
1653:58	First Officer	do you think you're gonna make this
1653:58	Captain	yeah...if I can catch the strobe light
1654:01	First Officer	five hundred, you're in good shape
1654:06	Flight Engineer	watch the, keep your airspeed up
1654:09	Sound similar to stall warning	

1654:10	Unidentified crew (don't) stall warning	
1654:11	Captain	I got it
1654:12	First Officer	stall warning
1654:12	Flight Engineer	stall warning
1654:13	Captain	I got it, back off

The CVR then recorded an unidentified crewmember say, "max power," followed by a second remark, "there it goes, there it goes."

1.1.1 Statements of Witnesses

More than 20 witness statements were received that described the events of the accident. These witnesses were located at various positions, either on the airport or in the vicinity, when they observed flight 808 on August 18, 1993.

A crew of four U.S. Navy pilots, who were located in the cockpit of a Lockheed C-130 that was on the airport ramp, observed the approach and subsequent crash of flight 808. One of the pilots stated:

...I saw the DC-8 on a wide right base for runway 10. It appeared to be at approximately 1,000 feet agl [above ground level]. I was interested in watching such a large airplane shoot the approach...It looked to me as if he was turning to final rather late so it surprised me to see him at 30 to 40 degrees AOB [angle of bank] trying to make final. At 400 feet agl, he increased angle of bank to at least 60 degrees in an effort to make the runway and was still overshooting. At this time the aircraft's nose turned right and it appeared he was trying to use bottom rudder to make the runway. At this point, he appeared to be 200 to 300 feet agl. He was still overshooting and my copilot remarked he was going to land on the ramp. His wings started to rock towards wings level and the nose pitched up. At this point the right wing appeared to stall, the aircraft rolled to 90 degrees AOB and the nose pitched down....

The other three crewmembers corroborated the aforementioned description of events.

The statements of many of the other witnesses who observed the DC-8 provided descriptions of the approach and crash sequence that were similar to those of the Navy pilots. Included in some of those statements were descriptions of the attitude of the airplane as it struck the ground and the explosion that occurred during the impact sequence. One witness, stated, in part:

...Just in front of the runway the jet tried to turn...to the right while it was very low to the ground. The nose and right wing hit almost simultaneously and the jet burst into flames sending up black smoke. Prior to the crash there were no flames or anything unusual about the aircraft.

The airplane struck the level terrain approximately 1400 feet west of the approach end of runway 10. The accident occurred during the hours of daylight at 19 degrees 54 minutes North latitude; and 75 degrees 13 minutes West Longitude. Figure 1 depicts the ground track of flight 808 derived from flight data recorder (FDR) information.

1.2 Injuries to Persons

<u>Injuries</u>	<u>Crew</u>	<u>Passengers</u>	<u>Other</u>	<u>Total</u>
Fatal	0	0	0	0
Serious	3	0	0	3
Minor/None	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	3	0	0	3

1.3 Damage to Aircraft

The airplane was destroyed by ground impact forces and a postaccident fire. The value of the airplane was estimated by AIA at \$5,000,000.

1.4 Other Damage

A concertina razor wire fence near the approach end of runway 10 was damaged by fire and several crash/fire/rescue vehicles that overran the fence during the fire-fighting operation.

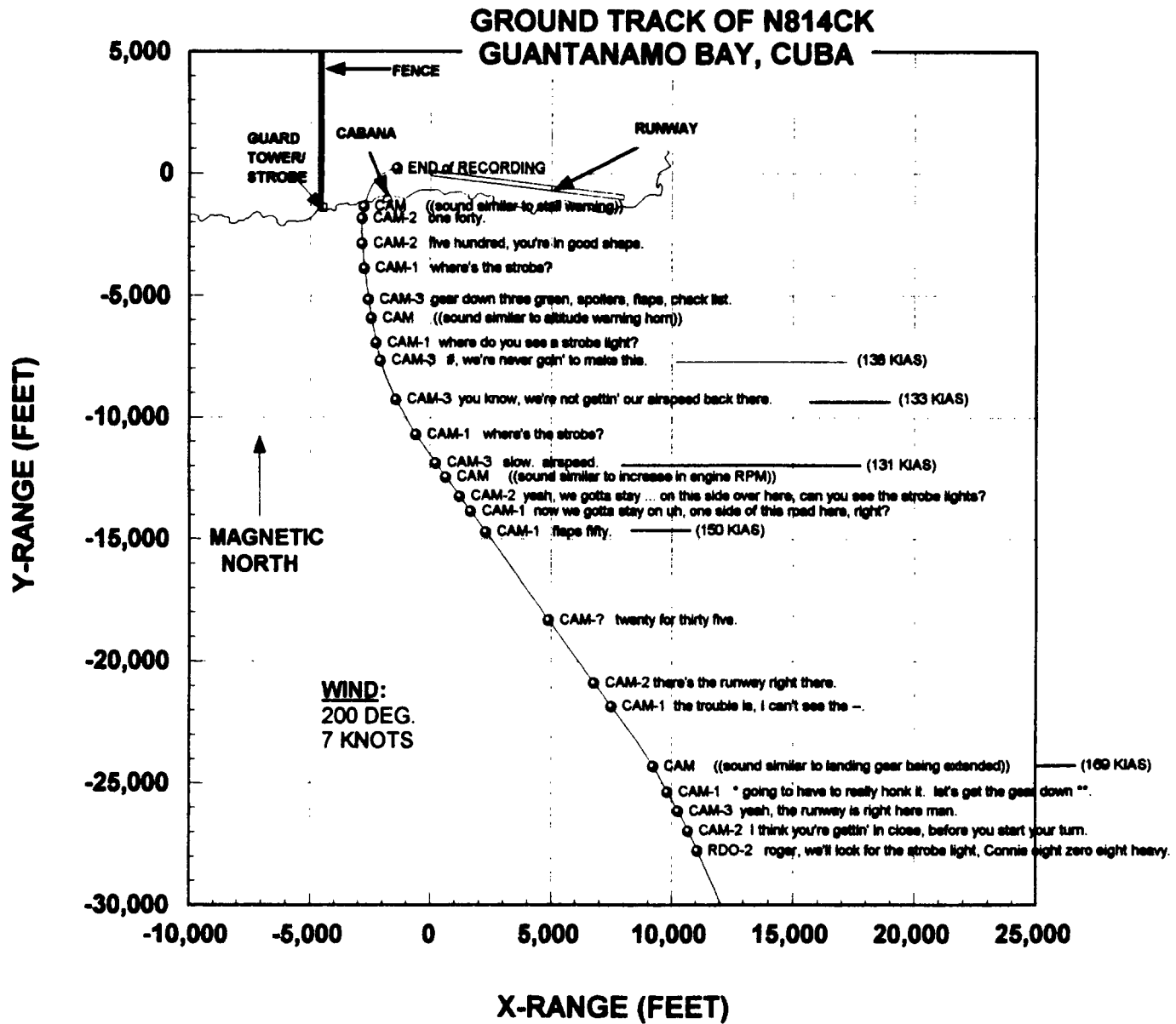


Figure 1.--Ground track of flight 808.

1.5 Personnel Information

1.5.1 The Captain

The captain, age 54, was hired by AIA on February 11, 1991, as a captain in the DC-8. He holds an Airline Transport Pilot (ATP) certificate with multiengine land airplane privileges and type ratings in the following airplanes: the DC-8, DC-9, and B-727. He also holds a commercial pilot certificate with a single engine land airplane rating, a flight engineer certificate with a turbopropeller rating, and a mechanic certificate with ratings for airframe and powerplant. The captain's first class airman medical certificate was issued on May 11, 1993, with a limitation that, "Holder shall possess correcting glasses for near vision while exercising the privileges of this airman's certificate."

Prior to being hired by AIA, he had been employed by Eastern Airlines, Inc., from 1966 until it ceased operations in 1991. During his employment with Eastern, he had flown as a flight engineer on the Lockheed L-188, and then upgraded to first officer on the Convair 440, Douglas DC-9, Boeing 727, and the Lockheed L-1011. He also flew as captain on the DC-9 and B-727.

According to company records, at the time of the accident the captain had accumulated approximately 20,727 hours of total flight time, of which about 16,200 hours had been accrued at Eastern. Since his employment at AIA, he had 1,527 hours as captain in the DC-8. A query of the Federal Aviation Administration (FAA) airman records in Oklahoma City, Oklahoma, revealed no previous enforcement action or accident history.

The captain successfully completed recurrent training and DC-8 ground school on February 12, 1993, and received international flight operations, hazardous material, and emergency procedures training, and special airports qualification. He also completed a pilot-in-command (PIC) proficiency check on February 20, 1993, a line check on April 8, 1993, and his last simulator recurrent training on August 4, 1993. The captain had no previous operational experience at Guantanamo Bay.

Interviews with pilots who have flown with the captain described him favorably and commented that he was very conscientious and good at managing the crew. A company flight instructor who had given the captain several checkrides described him as a good pilot who was "middle of the pack" in ability and who displayed good judgment when dealing with emergencies.

The captain had received a 2-day crew resource management (CRM) training while he was employed at Eastern Airlines. AIA does not have a formal CRM program; however, the company did attempt, on a limited basis, to instruct CRM principles informally during initial and recurrent training.

1.5.2 The First Officer

The first officer, age 49, was hired by AIA on November 3, 1992, as a DC-8 first officer. He holds an ATP certificate with multiengine land airplane privileges and type ratings for the Learjet, DC-8 and DC-9. He also holds a commercial pilot certificate with single-engine land airplane privileges and a flight engineer certificate with turbopropeller and turbojet ratings. His first class airman medical certificate was issued on April 6, 1993, with no limitations.

The first officer was also previously employed by Eastern Airlines from 1968 until 1991, and had flown as a flight engineer, first officer, and captain on a variety of airplanes. After leaving Eastern Airlines, he completed the DC-8 ATP program at Arrow Air Training Center that qualified him to exercise the privileges of PIC on the airplane. He held the position of co-captain on a twin engine turbopropeller airplane, operated by Eastern Foods and the Hooters Restaurant chain, until being hired by AIA.

According to AIA company records, at the time of the accident the first officer had accumulated approximately 15,350 hours of total flight time, of which about 492 hours were flown at AIA as both a first officer and captain on the DC-8. A query of the FAA airman records revealed no previous enforcement action or accident history.

The first officer completed company DC-8 recurrent ground training on August 13, 1993, and received international flight operations, hazardous material, and emergency procedures training; and special airports qualification. Interviews revealed that his peers regarded him as a "very competent" and "excellent" pilot.

Between the period of 1963 and 1968, the first officer served in the U.S. Navy as a pilot on an aircraft carrier. One of his assignments during that period was to monitor the activity in Cuba which was conducted with a Grumman S2E aircraft from the Leeward Airfield at Guantanamo Bay. However, he had not flown into the airport since that time.

The first officer had completed a 2-day CRM class while employed at Eastern Airlines; however, during his employment with AIA he had received "informal" CRM training.

1.5.3 The Flight Engineer

The flight engineer, age 35, was hired by AIA on February 11, 1991, as a DC-8 flight engineer. He holds a commercial pilot certificate with single and multiengine land and instrument airplane ratings. He also holds a flight engineer certificate with reciprocating and turbojet powered aircraft ratings, and a mechanic certificate with airframe and engine ratings. His first class airman medical certificate was issued on April 8, 1993, with no limitations.

According to company records, the flight engineer had been furloughed on May 1, 1991, and returned to AIA on October 31, 1991. During the furlough, he was employed by Trans Continental Airlines as a first officer on DC-6 airplanes. Upon his return to AIA, he resumed the duties of a flight engineer on the DC-8. On August 31, 1992, the flight engineer was again furloughed for approximately 1 month, and he has been continuously employed since his return.

At the time of the accident, the flight engineer had accumulated approximately 5,085 hours of total flight time, of which 1,500 hours were accrued as either a PIC or second-in-command (SIC), and 3,585 hours were as a flight engineer. His total flight engineer experience on the DC-8 was 1,085 hours, and he had accrued about 60 hours in the previous 30-day period. A query of the FAA airman records revealed no record of previous enforcement action or accident history.

The flight engineer successfully completed his last DC-8 flight engineer line check on June 26, 1992, and proficiency check on September 6, 1992. Company records indicate that during his last DC-8 ground school and recurrent training, he received international flight operations, hazardous material and emergency procedures training; and special airports qualification. The flight engineer had not received any CRM training from AIA.

The flight engineer was described by peers as "competent and conscientious," and that he did an effective job and spoke when he observed an unusual or abnormal situation.

1.5.4 Flightcrew Activities and Flight/Duty Times

According to interviews and AIA records, the captain and first officer were paired together on the 4-day trip sequence that began in Atlanta at 2300 on August 16, 1993, the start of their day. The flight engineer joined the pilots the following day during a layover in Ypsilanti, when he replaced the original flight engineer who had completed his sequence. The captain and flight engineer had flown together previously; however, the first officer was flying with the other crewmembers for the first time.

The captain had been off duty from August 1 through 5, and then flew a 4-day international sequence, August 6 through 9. He was again off duty until August 16. The captain stated that his activities immediately before the normally scheduled trip were routine and that in the 2 days before the trip, he typically went to bed about 2330 and awoke between 0700 and 0730.

The captain described himself as a "day person" who had some difficulty adjusting to night flying schedules. He also stated that his sleep pattern was normal during night hours when he was off-duty; however, he "was not a good sleeper" and his sleep was "not restful" when he was taking naps during the day.

On Monday, August 16 (the first day of the scheduled 4-day sequence), the captain jogged in the afternoon, took a nap between about 1700 and 1900, and then had dinner at home before reporting for duty.

The first officer was off duty from August 1 through 9, and then he attended a DC-8 recurrent training classes between August 10 and 13. He was again off duty from August 14 through 16, and spent that time at home with his family. He said that he slept his normal night time hours during the days off, going to bed about 2300 and receiving a "good" 8 hours sleep each night. He said that he also took a short nap on the afternoon of August 16, in preparation for reporting to duty.

The flight engineer had been off duty from August 1 until he joined the other crewmembers on August 17. He spent the days before the accident at home involved in routine activities while waiting for crew scheduling to provide a trip assignment. He said that he typically went to bed between 2100 and 2300, and awoke between 0800 and 0900 every day.

The flight engineer went to bed on the night of August 16 at between 2230 and 2300 and was awakened by the AIA crew scheduler at 0500 on August 17, assigning him the trip sequence with the accident captain and first officer.

1.5.5 Events Leading to the Accident

The first day of the trip sequence began at 2300 at ATL and terminated at DFW at 1200, following 13 hours on duty and 5.6 hours of actual flight time. The crew was provided a layover hotel at DFW and given a reporting time of 2300 for the next trip.

The captain said that he went to bed immediately after the trip and slept from about 1300 until 1800, then awoke, jogged, showered, and ate supper before reporting for duty.

The first officer did not go to bed immediately, but said he ate a large breakfast and read the newspapers for about 1 hour before going to sleep. He slept until about 1 hour before reporting time, and he exercised in the hotel room and had a meal before reporting for duty.

The flight engineer went to bed after breakfast and slept about six hours. He telephoned his wife in the evening from the hotel shortly before reporting for work and they spoke for 20 to 30 minutes. His wife said that when she talked with her husband he "sounded well rested."

The crew reported for duty at 2300, departed DFW, and arrived at the company base at YIP at 0325. They remained there for 3 hours while the freight was being sorted and loaded onto a second airplane. During the three-hour period, the captain and the first officer had coffee and doughnuts with another AIA captain in the company break room. The other captain described both crewmembers as cheerful, saying that the first officer was happy to be going back to his family. He said that both pilots seemed rested, at least "as much as you are at that time in the morning." The other AIA captain and the captain of the accident flight continued to converse for about 1 hour while the first officer "closed his eyes and relaxed in his seat in the airplane" for 30 to 60 minutes. The captain said that he did not rest during any of the layovers before the accident.

The crew departed YIP at 0620, and terminated the scheduled day in ATL at 0752. The flight engineer was provided a crew layover hotel room while the captain and first officer planned to return home during the scheduled layover.

About 0830, the chief AIA crew scheduler learned that flight 808 would need to be reassigned to fly to Guantanamo. The crew scheduler said that he was advised by the flight follower that the crew would finish within 24 hours duty time and that there were no legal problems with duty time because the flight to Guantanamo was considered to be "international." The scheduler said that it was company policy to avoid assigning crews to more than 24 hours continuous duty time, and with the revised schedule, the reassigned flight would have departed for Norfolk Naval Air Station, Virginia, (NGU) to load the contract freight, then fly to Guantanamo Bay, and return (ferrying the airplane under 14 CFR Part 91) to ATL within the 24-hour duty time limitation. The accumulated flight hours for the revised schedule were calculated to be about 11 hours and 45 minutes.

The crew scheduler was familiar with the three flight crewmembers and said that he had called on them numerous times in the past year for overtime assignments, which they typically accepted.

Upon notification of the reassignment, the crewmembers discussed the trip and decided it was legal, although they believed it to be a long duty day that was "pushing the edge." The captain stated in his postaccident interview that he did not feel particularly fatigued but would have rather gone to bed. The first officer stated in his interview that considering the legality of the trip and his knowledge of previous company actions, "you better really be tired" to refuse the trip.

The flight follower stated in an interview after the accident that during his conversation with the captain about the reassignment, the captain sounded normal and did not state that he was tired or fatigued.

The flight follower also said that according to the DOD contract for service to Guantanamo Bay, AIA would be penalized if too many flights in a 3-month period departed late from Norfolk. Because of the reassignment of airplanes, flight 808 was departing late. The flight follower said that she had telephoned personnel at the Leeward Point Airfield to advise them of the late arrival

of flight 808. Because she believed that a curfew⁵ was in effect, she requested that the airport remain open.

The captain stated in the post accident interview that during the approach briefing of Guantanamo Bay, he remarked that "if anyone [of the crewmembers] sees anything they don't like, call go-around."

The first officer said the crew had discussed the approach (referencing the approach plate) to Guantanamo Bay when they were about 50 miles from the airport. He also stated that he was satisfied that each of the crewmembers had a common understanding of what was necessary for a safe landing. The first officer said that he would have been "willing" to initiate a go-around even as the non-flying pilot. However, he also said that he would be hesitant to initiate the go-around in close proximity to the ground because it might create a dangerous situation if he took control of the airplane.

The first officer said that as they approached the airport he felt fully alert and exhilarated, as though he were making an aircraft carrier landing. The captain stated that he had felt tired and "lethargic" during the period when they were approaching the airport, and he also believed that the other two crewmembers were fatigued.

During the final portion of the approach, the CVR recorded both the first officer and flight engineer indicating their concern about the approach to the captain; however, neither crewmember called for a "go-around."

1.6 Airplane Information

1.6.1 General

N814CK, serial number 46127, was registered to American International Airways, Incorporated, d/b/a Connie Kalitta Services, of Morristown, Tennessee. The airplane was manufactured in December 1969 and was originally configured for passenger service. It had accumulated a total time of 43,947.4 hours and 18,829 cycles on the airframe.

⁵Leeward Point Airport is open and operational 24 hours a day. The airport is not restricted by a curfew; however, flight operations after dark are not recommended.

The airplane was equipped with four Pratt & Whitney JT3D-3B engines that were modified with the stage-2 hush kit. The engines had accumulated the following total time and cycles as of August 18, 1993:

Engine 1	SN 644595	48,470.3 hours	18,084 cycles
Engine 2	SN 645518	46,386.4 hours	26,164 cycles
Engine 3	SN 644487	54,285.4 hours	26,274 cycles
Engine 4	SN 644952	43,955.3 hours	17,663 cycles

1.6.2 Aircraft Weight and Balance Information

The following airplane information was derived from the AIA (FAA-approved) flight manual:

Maximum ramp weight (MRW):	323,300 pounds
Maximum takeoff weight (MTW):	320,300 pounds
Maximum landing weight (MLW):	240,000 pounds
Maximum payload:	80,360 pounds
Basic operating weight:	143,640 pounds
Fuel capacity:	150,400 pounds
Maximum zero fuel weight (MZFW):	224,000 pounds
Landing flaps	35 degrees ⁶

The takeoff weight for flight 808 was calculated by the flightcrew and determined to be 280,499 pounds (airplane basic operating weight of 143,640 pounds, 87,000 pounds of fuel and 52,859 pounds of cargo in the cabin). The maximum allowable takeoff weight was 284,300 pounds, which was based on the maximum landing weight plus the estimated fuel burn of 44,300 pounds. The required fuel for the accident trip was 75,100 pounds. The captain initially requested 86,000 pounds of fuel and later added an additional 1,000 pounds, for a total ramp departure fuel load of 87,000 pounds.

Based on the projected fuel burn of 44,300 pounds, the weight of the airplane upon landing at Guantanamo Bay would have been 237,199. The runway

⁶See section 1.6.3 for further details of authorized flap positions.

analysis provided to the flightcrew by the company flight followers determined the maximum allowable landing weights⁷ for flight 808 at Leeward Airfield to be:

RUNWAY 10

10 knot headwind	274,300 pounds
0 knot headwind	260,700 pounds
10 knot tailwind	237,800 pounds

RUNWAY 28

10 knot headwind	274,300 pounds
0 knot headwind	260,700 pounds
10 knot tailwind	237,800 pounds

At the time of the accident, the wind was reported to be from 200 degrees at 7 knots. At the projected landing weight of 237,199 pounds, flight 808 would not have exceeded the limitation for landing on runway 10.

The landing "V" speeds for the airplane configured for a 50-degree flap landing at a gross landing weight of approximately 236,000 pounds would have been 170 knots maneuvering speed,⁸ 147 knots (approach speed)⁹ and 142 knots (threshold speed).¹⁰

1.6.3 Supplemental Type Certificate Information

The flight manual for N814CK contained the following Supplemental Type Certificates (STC):

⁷The maximum allowable landing weight is predicated on operational antiskid and autospoiler systems, a dry runway, and landing flaps at 35 degrees.

⁸The maneuvering speed, which is the minimum speed for an aircraft configuration at which a 30-degree bank may be used. It is calculated at 1.5 times the stalling speed for the particular configuration or flap setting. This will normally be 15 degrees for QNC airplanes and 23/25 degrees for all others, as defined in the AIA DC-8 flight operating manual.

⁹The approach speed, which is threshold speed plus 5 knots. This speed is established after the aircraft is on final and the bank angle is limited to 15 degrees, as defined in the AIA DC-8 flight operating manual.

¹⁰The threshold speed, which is calculated at 1.3 times stall speed for the weight and landing flap setting, as defined in the AIA DC-8 flight operating manual.

1. STC No. SA1802SO, issued to Rosenbaum Aviation, Inc., was an airframe design change to permit the installation of a cargo door, cargo restraint bulkhead, heavy duty cabin floor, Class "E" cargo compartments, cargo pallet restraint system and provisions for two additional crewmembers.
2. STC No. SA5670NM, issued to Shannon Engineering, provided the specifications to install a cockpit warning system for 25-degree landing flaps. The aforementioned STC also required either the previous or concurrent installation of STC Nos. SA5510NM and 2411SO, which increased the airplane landing and zero fuel weights, and required the installation of the Quiet Nacelle Corporation Plus (QNC+) acoustically treated engine nacelles (stage 2 hush kit for noise reduction).

According to the supplement to the AIA airplane flight manual for the DC-8-61 equipped with the QNC+ conversion, the "Certificate Limitations, Procedures and Performance Information" authorizes 35 degrees of flaps as the normal landing flap configuration. It also states, "...flaps 50 is no longer an authorized landing flap (except for emergency purposes), and the 50-degree performance data in the Basic AFM is considered to be a part of Emergency Procedures for the purpose of this AFM Supplement."

The DC-8 was originally certified for 50-degree flap landing configurations. However, in 1985, the FAA adopted regulations limiting the noise produced by aircraft weighing more than 75,000 pounds. The DC-8 was one of many aircraft models that were equipped with engines that could not meet the noise limitations without modification. The QNC+ conversion was one such modification that "quieted" the engines with the use of acoustic insulated engine nacelles. The STC also modified the operating procedures of the airplane by reducing the "authorized" landing flap configuration from 50 degrees to 35 degrees of flaps to reduce engine thrust (reduced noise output) to comply with the noise regulations. The 50-degree flap restriction was not an aircraft performance limitation because of the conversion.

1.6.4 AIA DC-8 Maintenance and Inspection Program

Part D of the FAA-approved AIA Operations Specifications defines the approved maintenance program. The AIA General Maintenance Manual establishes the procedures and requirements for accomplishing maintenance and inspections. The program also includes a Continuing Analysis and Surveillance Program, which is defined in a Reliability Analysis Maintenance Planning Program (RAMP) manual.

AIA initiated a "C" check on N814CK in July, 1993. The inspection was completed, and the airplane returned to service on August 2, 1993. The maintenance records indicate that during the C check, three major nonroutine tasks were performed; the right elevator was replaced because of corrosion and cracking on the upper and lower skins; both control columns were replaced, and both sets of pilot rudder pedal bracket assemblies were inspected to comply with Airworthiness Directive (AD) 90-16-05 and Douglas Service Bulletin (SB) 27-273R1. The elevator and aileron control cable systems were rigged following the completion of the inspection.

At the time of the accident, the airplane had accumulated 31 hours of flight time since the completion of the C check.

1.6.5 Maintenance Records Review

In addition to the Deferred Maintenance Items (DMI) list, AD and SB compliance records, the aircraft logbook entries from June 2, 1993, through August 18, 1993, were reviewed. This review revealed that all applicable ADs and SBs had been accomplished, and that the four DMIs had been closed.

The DMI page from the aircraft papers indicated four discrepancies, two of which pertained to the No. 3 engine. One of the written items reported that the No. 3 THRUST BRAKE light had illuminated on August 4 and August 6, 1993. In the August 6 discrepancy, the reverser cascade door light was described as being "on." The same mechanic had signed the corrective action for both August occurrences and closed out the logbook entry with "removed and replaced," or "repaired" the cascade door assembly and "performed an operational check." Maintenance personnel had also documented that the reverser cascade door light was normal, per maintenance manual chapter 78. The additional deferred items referred to the No. 4 engine N2 indicator being "inop" and the No. 3 main fuel quantity indicator reading differently than the drip stick.

1.7 Meteorological Information

The 1700 reported surface weather conditions were:

Clouds 30,000 feet thin overcast, visibility 6 miles, temperature 88 degrees Fahrenheit, dew point 66 degrees Fahrenheit, wind 200 degrees at 7 knots, altimeter 30.02 inches Hg.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

The airport traffic area for the Leeward Point Airfield is defined as the Guantanamo reservation and the area to seaward, within a five statute mile radius of the airfield, up to, but not including, 3,000 feet above the ground. All aircraft within this area are required to maintain radio contact with air traffic controllers. The air traffic control facility is operational 24 hours a day and is staffed continuously by military personnel.

The Guantanamo radar control facility provides VFR advisory services only, with no IFR separation for aircraft transitioning to VFR and landing at Leeward Airfield. The arrival procedures indicate that if IFR conditions prevail at the airport, the controller will issue clearance to execute the published instrument approach. However, the approach terminates with circling (VFR) minimums.

The tower supervisor/local controller assumed the air traffic control duties about 1455 on the day of the accident. Upon assuming those duties, the controller determined that the high-intensity strobe was inoperative, and this information was immediately reported to the Marine Barracks.¹¹

¹¹The Marine Barracks is notified of the inoperative strobe because it is mounted on a Marine guard tower. The operation of the strobe is then verified to determine if the light has been manually extinguished or has sustained a mechanical malfunction. Once it has been determined that a mechanical malfunction exists, a work order is then initiated for the Public Works Department to conduct the repairs.

At the time of the accident, training of a new air traffic controller was being conducted in the control tower. The trainee was performing the duties of local control and had provided flight 808 with landing instructions, which included the standard phraseology, "caution prohibited Cuban airspace begins three-quarters of a mile west of the runway. You are required to remain within the first fence line designated by a high intensity strobe." The trainee was not aware that the strobe light was inoperative; and the supervisory controller, who was monitoring the communications, did not alert the flightcrew that the high-intensity strobe was inoperative.

1.10 Aerodrome Information

The Leeward Point Airfield of the U.S. Naval Station is located at the western end of the Guantanamo Bay Reservation. The airfield is approximately 56 feet above mean sea level (msl) and has a single runway, oriented east-west, and designated 10-28. The runway is constructed of reinforced concrete and is 8,000 feet long and 200 feet wide.

The airfield is equipped with a lighted 30-knot wind sock near the approach end of each runway and a free-swinging wind tee, located midfield, on the south side of the runway. Runway 10 is equipped with a portable fresnel lens that is 750 feet from the approach end and is positioned to provide a 3.25-degree glideslope angle.

Runway 28 is typically the "preferred" runway to land because of the unobstructed approach from the IFR/VFR transition points. Landing on runway 10 requires a standard right traffic pattern to be flown within 3/4 nautical mile of the approach end of the runway, due to prohibited airspace beyond that point. The VFR arrival/departure route chart published in the Naval Station Guantanamo Bay, Cuba, Air Department, Airfield Brief, states, in part:

Exercise EXTREME CAUTION when landing Runway 10 due to short final approach and prevailing crosswind.

To assist pilots performing this visual approach, the Naval reservation fence line is used as an identifying landing mark for planning the approach because it is located 3/4 of a nautical mile from the runway. Also located along the fence line are several Marine guard towers, a series of four flashing red lights, three steady illuminated red lights, and one high intensity white strobe light.

The strobe light, mounted on top of the Marine Outpost No. 1, located at the western boundary shoreline, is used only as a visual reference to identify the fence line readily (during day or night operations). It is neither a mandatory reporting point, nor is it necessary to identify its location to execute the approach to runway 10.

A second prominent visual reference point is a beach cabana located on the coastline, approximately 2,000 feet west of the runway 10 threshold, midway between the runway and the border fence on the coastline. Witnesses stated that flight 808 overflowed the cabana while on the base leg of the approach.

1.11 Flight Recorders

1.11.1 Flight Data Recorder

The airplane was equipped with a Fairchild model F800 (serial number 5156) digital flight data recorder (DFDR). It records Aeronautical Radio Incorporated (ARINC) 542 expanded configuration data as a function of elapsed time in digital format. The DFDR recorded indicated airspeed, magnetic heading, pressure altitude, vertical acceleration, microphone keying and time. It was transported to the Safety Board laboratories for readout and evaluation.

The data indicated that approximately 52 seconds before the accident, the airplane was in a right turn from an initial magnetic heading of 321 degrees and was descending through a pressure altitude of 829 feet. Approximately 38 seconds later, the normal acceleration¹² values increased while pressure altitude values decreased. Concurrently, the magnetic heading passed through 360 degrees, and the indicated airspeed value was 136 knots. The magnetic heading values continued to change in a manner that was consistent with a right turn, while the indicated airspeed value decreased to 113.12 knots, and the pressure altitude decreased to 327 feet. These values continued in their respective decreasing trends until the termination of the flight.

¹²Normal acceleration is the acceleration along the airplane's normal (vertical) axis, and the values are measured in units of "G" forces. "G" refers to a measure of the force on a body undergoing acceleration as a multiple of the force imposed by the acceleration of the Earth's gravity.

1.11.2 Cockpit Voice Recorder

The airplane was also equipped with a Sundstrand model AV-557B cockpit voice recorder (CVR), (serial number 510), that was removed from the accident airplane and transported to the Safety Board's laboratories in Washington, D.C., for transcript preparation. The CVR transcript was derived from the 4-channel recording of the audio control panels for the captain, the first officer, the flight engineer, and the audio signal input from the cockpit area microphone.

The exterior of the recorder exhibited "minor" structural damage and exposure to heat and fire. The magnetic audio tape was found undamaged, and the playback quality of the audio information was good.

1.12 Wreckage and Impact Information

1.12.1 General

The airplane initially struck the ground 200 feet north of the extended runway centerline and 1,400 feet west of the runway 10 threshold (see figure 2). The wreckage debris was oriented on a magnetic heading of approximately 100 degrees and extended for a distance of about 1,000 feet from the initial impact point. The debris found at the farthest point from the runway consisted primarily of right wing structure and skin, as well as parts from the Nos. 3 and 4 engines.

The initial impact mark was a thin, shallow trough that fanned outward to about 25 feet wide and extended 150 feet in the direction of flight. The right wing tip, found 200 feet north of the first impact point, exhibited compression damage and scratch marks that were consistent with the airplane in a roll attitude of 51 degrees at the point of initial ground impact.

All major portions of the airplane and flight control systems were accounted for at the accident site. There was no evidence of an in-flight fire, nor was there evidence of structural anomalies that would indicate a preimpact structural failure. Examination of the wreckage also revealed that the landing gear was in the down and locked position; the elevator pitch trim was in the 7 degree-nose-up position; the leading edge slots were in the open position; and the wing flaps were in the 50-degree down position at the time of ground impact.

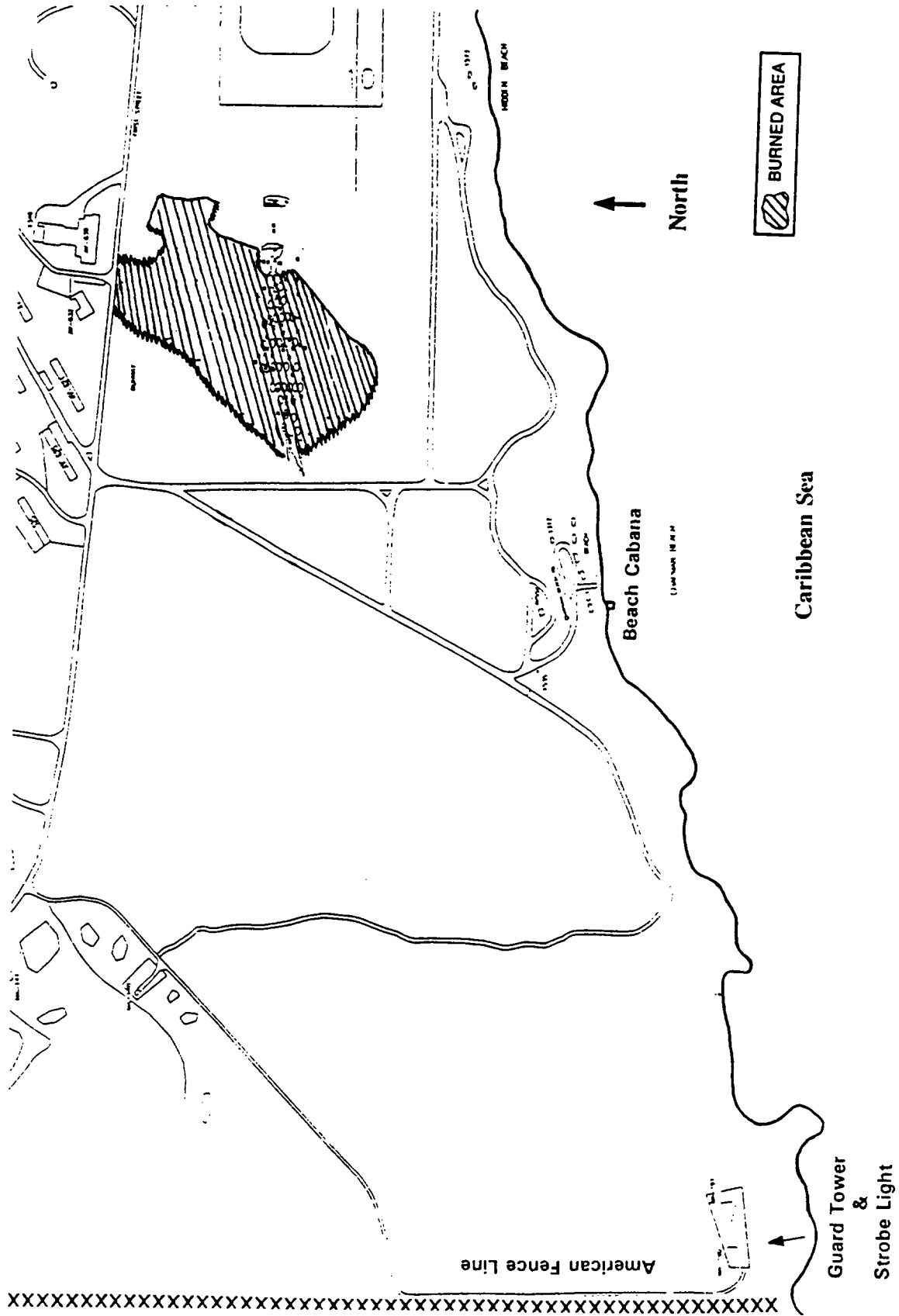


Figure 2.--Location of airplane wreckage.

1.12.2 Cockpit Documentation

The airspeed indicators in the DC-8-61 are pneumatically driven with electrical compensation for pressure measurement errors and other factors. The right pitot tube was bent toward the fuselage and had soil packed into the tip. The pitot static system was breached at numerous fuselage separations. Fiber optics were used to internally examine the airspeed indicators. Each had a burred rack gear that aligned with the pinion gear at a displayed indication of 115 - 120 knots.

The captain and first officer's airspeed indicators are equipped with internal and external "bugs" that are used to identify reference airspeeds. The bug settings found on the captain's airspeed indicator were: 78, 147, and 151 knots. The external bug settings found on the first officer's airspeed indicator were: 100, 138, 146, and 176 knots. The internal bug was set at 148 knots.

1.12.3 Flight Controls

All flight control surfaces were accounted for in the wreckage and along the debris path. However, the fire consumed the majority of the wing flaps and spoiler panels on both the left and right wings. The flight control system paths in the wings and fuselage were destroyed either by fire or impact, and flight control system continuity could not be established. Examination of the control cables did not reveal evidence of preimpact defects.

The cockpit gust lock control handle was found in the OFF/UNLOCKED position.

The rudder trim tab trailing edge was found deflected 4 inches to the left of the rudder trailing edge, when the rudder was centered. The cockpit pedestal knob was found at 6 1/2 units left rudder trim. The system control cables had tension-type failures at fuselage separation points. The cables had evidence of rust near the power pack in the base of the vertical stabilizer. Also, fresh grease was found on the manual reversion mechanism in this same area.

1.12.4 Engines

The four engines were found in areas that had been blackened in the postaccident fire. All four exhibited evidence of rotation at the time of impact, although speed of rotation was not determined on-site.

The thrust reversers for each of the four engines were separated from their respective turbine sections and the thrust deflectors, and three of the four reverser cascade doors were found in stowed positions. Examination of the cascade door with the extended actuator revealed an impact mark on the shaft that corresponded with the door being in the stowed position at impact.

1.13 Medical and Pathological Information

Toxicological tests were performed by the Jackson Memorial Hospital laboratory, Miami, Florida, on blood and urine samples obtained from the three crewmembers shortly after they were admitted to the hospital. The captain's samples were obtained between 0212 and 0220 on August 19, the first officer's at 2233 on August 18 (urine sample only), and the flight engineer's between 0418 and 0444 on August 19. The blood samples were tested for alcohol; and the urine samples were screened for drugs, which included cocaine metabolite, cannabinoids, opiates, benzodiazepines, and amphetamines.

The first officer tested positive for codeine, which is a pain suppressant. According to personnel in the hospital trauma center, this drug was most probably administered after the accident. All other toxicology tests performed on the samples from the three crewmembers were negative.

1.14 Fire

Several fires erupted after the airplane impacted the ground. These fires either self-extinguished or were extinguished by the Guantanamo Bay Naval Air Station airport rescue and fire fighting (ARFF) personnel. According to base personnel, all major fire fighting apparatus responded within approximately one minute of the accident and were used to extinguish the fire that engulfed the airplane wreckage and the approximate 30 acres of vegetation surrounding a portion of the accident site.

The ARFF vehicles expended 275 gallons of AFFF (foam), 907 pounds of Halon 1211, and approximately 37,500 gallons of water. One of the vehicles sustained damage during the fire fighting operation when the crew left the vehicle to extricate the flightcrew from the wreckage. The vehicle was damaged by the brush fire that advanced across the field and under the truck.

1.15 Survival Aspects

The forward portion of the fuselage, including the cockpit, separated from the remainder of the airplane and came to rest partially inverted outside the fire burn area.

Except for a hole in the right side wall between the first officer's seat base and the rudder pedals, the cockpit remained intact. The forward seat supports failed on both the captain's and first officer's seats, and although the cockpit floor was inverted, the flight engineer seat was found attached in its normal mounted position. The safety belts were found frayed but were not broken.

The cockpit bulkhead wall that supports the cockpit door was found to be partially separated. The cargo straps in the forward fuselage were found secured to their respective tied down rings, and the cargo was still restrained under the cargo netting.

The impact conditions and movement of the airplane were omnidirectional after ground contact. The dynamic forces of the airplane's movement on the ground did not exceed the levels of human tolerance.¹³

1.16 Test and Research

1.16.1 Flightpath Study

The Safety Board completed a flight simulation study that compared the FDR data and motion calculations to reconstruct a probable flight profile for flight 808. Information on the airplane's performance is in appendix C.

The study revealed that the load factor data recorded by the FDR, combined with turning performance calculations, indicate that the airplane's roll angles were less than 30 degrees at the approximate point where the turn from base leg to final approach was initiated. Based on the airplane's gross weight of approximately 236,000 pounds and a flap setting of 50 degrees, the approach

¹³The level of human tolerance is defined in the U.S. Army *Aircraft Crash Survival Design Guide*, Volume II, as the "tolerable levels [G forces] of the decelerative loads [including the loads imposed by seat and restraint systems], depending on the direction of the load, the orientation of the body and the means of applying the load...."

reference speed should have been 147 knots. The FDR revealed that the airplane was at a speed of 140 knots when the turn was initiated.

A ground track generated from the FDR and meteorological data indicated that the airplane was approximately 3,000 feet west and 2,000 feet south of the runway 10 threshold (approximately 1,000 feet from the shoreline) when the turn was initiated. The fence line is located 4,560 feet west of the runway threshold.

The study was able to replicate the motion of the airplane from the positions defined by the FDR data and witness information. It revealed that the airplane had rolled to a 60-degree, right-wing-down attitude prior to impact; the stick shaker (stall warning) had activated 7 seconds prior to impact and at a speed of 136 knots, and that the ground impact occurred at an airspeed of approximately 120 knots.

1.17 Additional Information

1.17.1 Company History

The company began in 1968 as Kalitta Flying Services, Inc., with one Cessna 310 airplane, followed by the acquisition of a Beech 18 in 1971.

Several additional airplanes of varying makes and models were added, including three Learjets and five turbine-powered Beech airplanes. In 1983, Kalitta Flying Services, Inc., acquired the operating certificate of Jetway Aviation, a Part 121 air carrier, and added one DC-8-21 and three Learjets to the operation.

In 1984, the company leased one DC-9-15 and three DC-8s from United Air Lines, Inc., and conducted joint operations under Part 135 and Part 121 supplemental. In December 1984, the Federal Aviation Administration (FAA) revoked Kalitta Flying Services' certificate after an investigation revealed Federal Aviation Regulation (FAR) violations in the Part 135 operation.

In May 1985, the company separated the Part 121 supplemental and Part 135 operations; and the Part 121 supplemental division began operating as American International Airways, Inc. (AIA). The Part 121 regulations pertained to not only cargo but to chartered passenger operations. AIA conducted business as Connie Kalitta Services, Inc., an ad hoc air carrier, using two leased B-727 airplanes from Flying Tigers, Inc. In 1986, the company purchased a B-727, followed in

1987, with the purchase of two DC-8-50 airplanes. In 1988, the two leased B-727s were returned to Flying Tigers, Inc., and AIA began to specialize and concentrate on the DC-8 operations.

In anticipation of a postal contract, AIA acquired two DC-9s and a second B-727. During the following years, additional airplanes were added to the fleet, including two B-747s configured for freight and two B-747s configured for passengers.

The B-747 operation was conducted under the company name, American International Cargo, Inc., providing cargo service from Los Angeles, California (LAX), to Honolulu, Hawaii (HNL), 4 nights per week. On Saturdays, the flight continued from HNL to Pago Pago, Melbourne, Australia, and Hong Kong and returned via Chitose, Japan, and Fairbanks, Alaska, to Lockbourne, Ohio. The second B-747 freighter was used on an ad hoc basis.

The two passenger configured B-747s were wet leased to Saudi Arabian Airlines based in Jeddah, Saudi Arabia. The airplanes were used to fly Saudi Arabian Airlines' routes using AIA flightcrews.

AIA's operations specifications indicated that at the time of the accident, the fleet consisted of 3 B-727s, 4 B-747s, 2 DC-9s, and 19 DC-8s, excluding the accident airplane. Additionally, seven of the DC-8s were leased, including four from Burlington Express, Inc.

In May 1993, AIA acquired the assets of the Zantop Airlines freight hub system in Ypsilanti, Michigan, which operates three DC-8s, and one DC-9 leased from AIA, and six L-188 Electras owned by Zantop. The new company currently operates as American International Freight, Inc.

The conglomeration of Kalitta companies consists of the following entities:

American International Airways, Inc. d/b/a Connie Kalitta Services, Inc., the Part 121 supplemental operation; Kalitta Flying Services, Inc., a Part 135 operation; Bounty Aviation, Inc., an FAA-approved repair station for aircraft accessories; Bounty Engine Services, Inc., an FAA-approved repair station for JT3-3B engines; Connie Kalitta Enterprises, an FAA-approved repair station for

Garrett engines; Airline Deicing Inc., which provides deicing operations at Ypsilanti; Aerodata Aircraft Instrument Service, an FAA-approved repair station for airplane instruments; and American International Services, Inc., a management company set up to manage bidding and contract operations of FAR Part 135 airplanes.

The Kalitta companies also include:

American International Freight, Inc., the cargo company (Zantop) operated at Ypsilanti, and American International Cargo, Inc., the air cargo company with scheduled LAX to HNL freight operations.

Trans Continental Airlines, Inc., a Part 121 air carrier purchased out of bankruptcy, was acquired; however, this operation is maintained independently of the Kalitta companies. The FAA operating certificate had not been issued as of the date of the accident, and the request was still pending before the Department of Transportation (DOT).

1.17.2 Management Hierarchy

The President/Chief Executive Officer (CEO) of AIA is also the founder and principal stock holder. He is directly responsible for the management of the company; however, the day-to-day operations are normally administered by the Vice President (General Manager) and/or the Director of Operations (D/O), with oversight by the President.

In an interview with Safety Board investigators, the CEO described the operating philosophy of the company and indicated that flight and duty time schedules were an important issue in air freight service. He said that in order to remain competitive, the company must often assign long duty times and "work everything right to the edge" of what was allowed by federal regulations. He indicated that this practice was "common" in the air freight industry.

The CEO also characterized the pilots' salaries as being slightly higher than the industry average for the overnight freight business. He described pilot morale as "fairly decent," although the pilot group had recently voted to unionize. According to the CEO, a major factor in the pilots acquiring union representation was due, in part, to the company's practice of upgrading pilots by performance

rather than seniority. The CEO also said that "good" pilots were recognized for their professionalism and "pulling for the company" through support of company requirements and practices, thus they were upgraded "out of seniority."

The CEO also stated that the company was structured and operated using a "lean management" philosophy rather than overstaffing at the management level like some competitors. He said that this type of management structure requires management personnel to be responsible for, and perform multiple roles in the company, thus reducing the number of individual managers. This situation is characterized by the position of D/O, who, in addition to his duties to dispatch aircraft, is also responsible for crew training, crew scheduling, and fleet management.

The CEO described the local FAA office personnel as helpful and better than other FAA offices overseeing similar companies. The CEO also stated that AIA's relationship with the FAA was "sometimes difficult," but that the company and the FAA had always managed to work out any issues and differences.

The Vice President and General Manager (VP/GM) of AIA had been employed by the company since 1983. He held several different positions with the company prior to his current position, including flight engineer, check flight engineer, and director of maintenance. As VP/GM, he was directly accountable to the President/CEO and was responsible for ensuring that all company, state, and federal regulations governing air transportation were in compliance, as well as overseeing the day-to-day operations. There are no FARs that specify the minimum qualifications for an individual to hold the position of VP/GM. At the time of the accident, although rated as a flight engineer, he was not type rated in any of the model airplanes flown by Connie Kalitta Services, Inc.

The D/O at the time of the accident had been employed by Kalitta Companies since 1988. He was hired initially as the chief pilot and D/O for Kalitta Flying Services, Inc., the FAR Part 135 Division, and later became the D/O for AIA in 1989. 14 CFR Part 121 specifies qualifications for the position of D/O, and require that a person will:

...hold or has held an airline transport pilot certificate, and has had at least three years of experience as pilot in command of a large aircraft; or has had at least three years of experience as D/O....

Although the D/O did meet the regulatory requirements of the position, he was not type rated in any of the large turbojet airplanes flown by Connie Kalitta Services, Inc.

The D/O was responsible for the FAR Part 121 flight operations, such as crew training; crew scheduling; flight following/dispatch; fleet management, sales; operating manual composition, control, and revision; Airlift Mobility Command (AMC) contract negotiations; liaison with all governmental agencies, including the FAA, U. S. Customs, airport authorities; and the day-to-day corporate functions and resolution of issues. The D/O also maintained the minimum equipment list (MEL) for all the airplanes and the Operations Specifications for Part 121 operations.

In his capacity as D/O, he was responsible for all phases of the dispatching of aircraft. This responsibility was shared jointly with the PIC, and, in accordance with the FARs, the D/O could delegate the authority to other persons (company flight followers) to dispatch a flight; however, he still maintained responsibility and accountability. The practices with regard to this portion of the operation were shared by the Vice President, the D/O, and the flight followers on duty.

The Chief Pilot was accountable to the Director of Operations for all activities which pertained to general supervision of flight crewmembers and flight operations. He was also responsible for ensuring that pilots maintain their proficiency and that all levels of flight operations are safe. According to the D/O, the company hired four different pilots to fulfill the duties of the Chief Pilot during the previous 8 years.

1.17.3 Flight Following System

The control office for flight operations at AIA is located at the company's main base in YIP. The operations control center/flight following department provides operational control for all company airplanes anywhere in the world. The only persons authorized to release the airplanes for flight are the President, Vice President/General Manager, Director of Operations, and the Chief Pilot.

Under the provisions of Part 121 supplemental, an air carrier can use either an established flight dispatch system or a flight following system. The flight

dispatch system requires that the dispatch personnel be qualified and trained in accordance with 14 CFR Section 121.463. These requirements include possessing an FAA-issued aircraft dispatcher certificate, receiving operational and differences training for each aircraft in operation, and observing at least five hours of flight deck operations. This system also establishes daily duty limits and incorporates the dispatcher into the chain of responsibility, along with the D/O and the PIC, to ensure the proper operational control of each flight.

The flight following system is intended as a means to monitor the disposition of an airplane when it is released to conduct flight operations. The FARs do not require the company flight followers to have any formal training nor hold an FAA-issued aircraft dispatcher certificate. Additionally, the flight followers are not required to be knowledgeable about aircraft operations or limited to a daily duty period.

In an interview with AIA's chief dispatcher, approximately one-half of the company flight followers held an FAA-issued dispatcher certificate, and they did receive limited "formal" training in the dispatching of aircraft. The Director of Operations stated that it is company policy that a newly hired flight follower obtain an FAA dispatcher certificate within 1 year of employment and that the company provides both financial assistance and reduced workload while the employee is in training for the dispatch certificate.

According to the company Flight Following Procedures Manual, the flight following department was comprised of a "chief dispatcher" and a supervisor of flight followers/dispatchers, three shift supervisors, seven flight followers/dispatchers, and three positions occupied by personnel in training.

The VP/GM stated that AIA has neither a formal safety department (flight safety office), nor an individual to address safety issues, concerns, and problems. However, he said the company practice for the resolution of safety matters or the communication of information was accomplished by the issuance of "operations memos or operations bulletins" by the appropriate management personnel.

1.17.4 Special Airport Pilot Training and Qualifications

The "special airports" video tape presentation used by AIA for training consisted of 11 different short segments depicting the visual approaches to these

airports. Each segment was narrated to provide a verbal description of the approach procedure, obstacles, and hazards associated with these particular airports.

The video segment for Guantanamo Bay depicted the approaches to both runway 28 and runway 10. The approach to runway 10 was viewed from the cockpit of the camera airplane and showed the approach being flown from both the right and left downwind positions. The narrator described landmarks that are visible to the pilot, including the fence line, the guard towers located on the fence line, and the flashing strobe light identifying the boundary. Also emphasized was the wind considerations affecting the approach and the need to initiate the turn to final approach prior to crossing the shoreline.

According to documents supplied by the Air Mobility Command (AMC), there are 12 airports, including Guantanamo Bay, that are designated "certification airfields." These airports have been identified by the military to have unique hazards or operating procedures which require a heightened awareness or familiarity on the part of the crewmembers. Thus, an airport that is designated as a certification airfield requires military flightcrew members, specifically the aircraft commander, to have operated into that airfield within the past 2 years as either a pilot, copilot, or observer who has actively monitored the approach.

In contrast, the AMC procedures for civilian crews flying into Guantanamo Bay require the contract company and flightcrews to be knowledgeable in the operation into the military airfields. The contract administrator at Norfolk Naval Air Station, who had retired from the U. S. Air Force, used his own briefing for Guantanamo Bay that he developed for the Air Force while on active duty. The airfield briefing form contained a photograph of the airfield showing the approach end of runway 10 and describing the procedures for execution of the approach.

The AMC contract representative from Norfolk (NGU) was interviewed about the procedures and events involving flight 808 on the day of the accident. He stated that he recognized the accident captain and believed that he [the captain] had been to NGU several times in the recent past. The contract representative also stated that, since he believed the accident captain had been to Guantanamo Bay previously, he did not provide him with the briefing form.

14 CFR Section 121.445 states that the PIC will be qualified to operate an aircraft into certain airports determined to be special (due to items, such as surrounding terrain, obstructions, complex approach or departure procedures). The

regulation requires that the PIC may not operate into a special airport unless within the preceding 12 months:

(b) except as provided in paragraph (c) of this section...(1) The pilot-in-command or second in command has made an entry to that airport (including a takeoff and landing) while serving as a pilot flight crewmember; or

(2) The pilot-in-command has qualified by using pictorial means acceptable to the administrator for the airport.

Subparagraph (c) of the regulation states that the aforementioned qualifications do not apply when "entry to that airport (including takeoff or a landing) is being made if the ceiling at that airport is at least 1,000 feet above the lowest MEA or MOCA, or initial approach altitude prescribed for the instrument approach procedure for that airport and the visibility at that airport is at least 3 miles."

1.17.5 Military Contracts

AIA entered into a military contract with the AMC, effective January 1, 1993, in a "team" arrangement with several airlines, including United Parcel Service Company, United Air Lines, Inc., Tower Air Inc., and Burlington Air Express, Inc. The purpose of the contract was to provide on-demand, international long and/or short range airlift services for the military. These services included passenger, cargo and/or aeromedical transportation as required by the AMC. AIA had committed 16 airplanes to the Civil Reserve Air Fleet (CRAF): 13 DC-8s and three B-747s, all configured for freight. The total number of airplanes committed to the CRAF determined the percentage of the amount of military contract flying received.

Under the "team" concept, the contracted airline had a pool of other carriers available that could fulfill the AMC's particular request to either supply airplanes or crews for the particular mission. An example of this process would be as follows: if AIA was tasked for a passenger operation, the mission would be reassigned to one of the team contractors who operated passenger-configured airplanes; conversely, if a passenger-carrying airline was contracted to move freight, it could reassign the trip to AIA or one of the other similar operators available to complete the mission.

The accident flight from NGU to Guantanamo Bay was contracted by AMC for the purpose of transporting cargo, mail, and food products to the Naval facility. As part of the written contract between civilian carriers and the AMC, the airline was required to coordinate the flight activities with a contract administrator representative. The contract representative at the origination airport was responsible for the unloading/loading of the airplane, flight plan filing, fueling, briefings, and liaison with the Air Terminal Operations Center.

1.17.6 FAA Oversight and Surveillance

The FAA surveillance of AIA was the responsibility of the Flight Standards District Office (DTW-FSDO) located at Willow Run Airport in Belleville, Michigan. The DTW-FSDO is located across the airfield from the AIA main base headquarters and maintenance facility. The staffing in the DTW-FSDO was characterized by the Principal Operations Inspector (POI) as "minimum," with 57 positions allocated, but only 42 occupied. The POI for AIA stated that the management of the certificate was accomplished by himself, two assistant POIs, a Principal Maintenance Inspector (PMI), a PMI assistant, a Principal Avionics Inspector (PAI), and a PAI assistant. The assistants were not assigned to the AIA operation on a full-time basis, but rather, they would assist when needed. The POI stated that he and the PMI spent 100 percent of their time on the management of the AIA certificate, while the PAI spent about 50 percent because he was responsible for four other carriers.

The POI had served in that capacity since 1989. He was responsible for the management of the AIA certificate and, because of the size and complexity of the carrier, this was his only assigned operator. He described his responsibilities as the POI of AIA in part as "keeping an eye on the carrier and the carrier's operation to ensure that they complied with the regulations in all aspects in their day to day operation and any proposed new operations...." The POI also stated that "99.9 percent" of his workload is dedicated to the oversight of the AIA operation, and that although there were two other FAA inspectors designated to assist in the oversight process, they were also assigned to assist another POI responsible for a similar freight operator.

The POI stated that because AIA conducts flight operations at various locations around the world, he was dependent upon the support from the geographical section of various FAA offices to monitor and oversee the AIA operations in Oskoda, Michigan; Miami, Florida; Saudi Arabia; and South America.

This type of surveillance support was also necessary in other locations due to flightcrew training being conducted in Denver, Colorado, and Minneapolis, Minnesota. Regarding pilot training conducted in Denver, the POI said that, "... I would have personally liked to have gotten out there three or four times a year for myself to see what's going on...but the funds weren't always there to provide for the travel."

Accordingly, due to fiscal restraints, the POI was unable to perform international surveillance; and was therefore dependent upon geographic support at these remote locations. However, he stated that this support was "virtually zero" in the Saudi Arabian operation and that he was "never able to get any help" with the South American operation.

In a memorandum dated August 2, 1993, and addressed to the assistant manager of the DTW-FSDO, the POI, PMI and PAI expressed their concerns regarding the inability to perform their necessary surveillance due to lack of funds (See appendix D). The memorandum also stated that the geographic support that had been requested has resulted in "limited feedback," and that as the AIA "geographical sphere expands, so do their problems, and our limited surveillance consistently reveals the same negative trends." The memorandum further stated that, "for this reason we have grave concerns regarding the quality of the CKSA [Connie Kalitta Services] (AIA) operations in these remote locations in the past and the future. Please consider this notice that we can no longer accept full responsibility for the CKSA certificate management, particularly those portions requiring extended travel...."

The POI characterized AIA as a company that meets the "minimum standards; and no more," because "they operate close to the cuff." He also said that the president tried to run the airline like a "mom and pop operation," with minimum numbers of personnel, many of whom were "overworked." He also stated that it was difficult to get the company to respond to changes he felt were necessary. He said that when he found problems, AIA would fix them by "decree;" however, upon his return, the problems still existed and it took more than one letter to the carrier to "get things accomplished."

The POI said that he often had to resort to unorthodox methods to make AIA take corrective actions on the negative findings. One example that he cited was his refusal to issue the operating certificate for the B-747 operations until

the company complied with corrective actions to findings in the January 1993 main base inspection.

The POI also described the company attitude as a "we versus them" mentality between flightcrews and management and that it was his belief this was reflected in the recent vote by the pilots favoring representation by a union. Additionally, he cited three examples to describe this type of attitude in the AIA operation which involved either the D/O or the Supervisor of Flight Following. First, the D/O, in addition to all his normal activities, was responsible for all the MELs on all the airplanes in the fleet because there was no one else assigned to perform the job. This type of activity can be time consuming and labor intensive, and required the MELs to be current for each airplane. Several FAA-conducted inspections, including routine checks and the main base inspection conducted by the POI, revealed that MELs for various model airplanes had not been maintained in a current status. The POI stated in the main base inspection report:

For the past 2 years CKSA has had a continuing problem in maintaining the required Operations manuals in current status.... When deficiencies in manuals become apparent and revisions are required, response has been very slow from operator.

Once revisions are made, the system for ensuring distribution to each location and manual holder doesn't seem to work, as when manuals are checked, they are often found in uncurrent condition....

Second, the POI stated that the Supervisor of Flight Following appeared to be tied to a routine dispatch slot well in excess of 40 hours per week, and that there was minimal time spent supervising the other members of the department.

Third, he said that the rapid expansion of the airline had exceeded the capabilities of the organization's structure and that the profit motive was "strong and hard to turn around." His characterization of the management attitude was that it was lacking "sensitivity training," and that he had observed management being abusive and intimidating to company personnel.

The POI stated he had been contacted many times by crewmembers via telephone and letters regarding long duty days, flight hours, and safety violations. Most of the individuals wanted to remain anonymous for fear of company reprisals.

He said that he never processed an enforcement action against the company for flight/duty time violations; however, he stated that "...if ten percent of the calls were true, why can't I find something?"¹⁴ A review by the Safety Board of the FAA inspections performed on AIA revealed that since 1989, the following major inspections were performed:

National Aviation Safety Inspection Program (NASIP)
Performed February 21 - March 16, 1989.

Annual Main Base Inspection conducted by the local FSDO
Performed January 19 - January 22, 1993.

The inspection found numerous discrepancies in both operations and airworthiness areas that initiated enforcement actions by the POI and PMI:

Regional Aviation Safety Inspection Report (RASIP)
Performed August 9 - August 16, 1993.

The inspection found a total of 14 findings that included 11 in operations and 3 in airworthiness:

Special Inspection conducted by a select national team that commenced on October 25, 1993, and lasted approximately 10 days.

A Work Accomplishment Summary indicated that 100 percent of the FAA's NASIP requirements were met by the FSDO in fiscal year (FY) 1993. However, a waiver had been granted regarding the surveillance of the Saudi Arabian operations by the manager of the FAA Safety Analysis Branch. A review of the Detroit FSDO records revealed that all of the planned program requirements for surveillance of AIA in FY 93 were not met. According to the POI, the completion percentage rates (ranging from 55.5 to 91.2) were so varied because of the lack of geographical support, which was necessary to accomplish the program requirements.

¹⁴During the course of the investigation, the Safety Board received numerous unsolicited telephone calls from former AIA employees citing the alleged conduct and safety violations of the company. These allegations were forwarded to the FAA for further investigation and validation.

During the period January 13, 1991, to August 16, 1993, 22 enforcement actions were initiated against AIA. Of those, 8 were closed and 14 remained open.

1.17.7 Department of Defense Surveillance

The Department of Defense (DOD) performs a biennial air carrier survey of all participating contract carriers in service with the DOD. In August 1991, a survey was performed at AIA, and both maintenance and operational deficiencies were found. A subsequent evaluation was conducted in March 1992, and negative operational and maintenance deficiencies were again found, some of which were recurring items. A Special DOD Air Carrier Review Committee directed a survey of AIA to be conducted in July 1992 to determine if the company had made progress in correcting the deficient areas. Accordingly, the DOD found that the operational concerns had been "adequately" addressed, however, maintenance deficiencies still remained. The areas of concern were maintenance training, reliability, manuals, and quality assurance. According to the Deputy Director, DOD Air Carrier Survey and Analysis Office, AIA was placed on an annual survey schedule rather than the normal biennial schedule because of the previous findings (primarily in maintenance). AIA made a presentation to the AMC regarding the integration of B-747s to the contract operations and responded to the DOD concerns at that time. The DOD approved the addition of the B-747 airplanes to the freight operation of the military contract. The addition of these airplanes also required the company to be surveyed annually.

1.17.8 Northwest Airlines Incident at Guantanamo Bay

On October 10, 1993, a DC-10, operated by Northwest Airlines as flight 9412, a DOD contract charter flight from Cherry Point, North Carolina, to Guantanamo Bay, had an incident while landing on runway 10. The captain stated after the incident that the crew had been given "short notice" about the flight and that because of the "limited time available for proper planning," he was not "aware of the hazards associated with an approach to runway 10...especially for a heavy aircraft such as the DC-10." He described the events of the incident in a written statement and indicated that:

"... making a right turn to final [for runway 10]. The winds although light were from right to left, requiring a tighter turn to line up with the runway. I was anticipating the problem but probably

overcompensated for the amount of wind and as I was in the flare for landing, the heading of the aircraft caused me to drift toward the upwind side of the runway. The touchdown was normal but the right main gear touchdown was just to the right of the runway edge.... The right main landing gear struck one runway edge light...."

The captain also stated that he was notified by crew scheduling of the charter flight at 2330, on October 17, and that the reporting time for the flight was 0210, October 18. The captain said that he "only managed to receive about one hour rest before leaving for the airport after being awake all day."

Additionally, the Safety Board found that the Northwest Airlines flightcrew had not received any supplemental special airport information from the DOD or the airfield operations office at Cherry Point Naval Air Station, regarding procedures at Leeward Point Airfield, even after the accident involving AIA.

1.17.9 Crewmember Flight and Duty Time Limitations

AIA is certificated under the supplemental regulations of Part 121. Subpart S, of the Code of Federal Aviation Regulations, entitled, "Flight Time Limitations and Rest Requirements: Supplemental Air Carriers and Commercial Operators" addresses the requirements for crew flight and duty time. Paragraph 121.503, Flight time limitations: Pilots; Airplanes, states:

- (a) A supplemental air carrier or commercial operator may schedule a pilot to fly in an airplane for eight hours or less during any 24 consecutive hours without a rest period during those eight hours.
- (b) Each pilot who has flown more than eight hours during any 24 consecutive hours must be given at least 16 hours of rest before being assigned to any duty with the air carrier or commercial operator.
- (c) Each supplemental air carrier and commercial operator shall relieve each pilot from all duty for at least 24 consecutive hours at least once during any seven consecutive days.

(d) No pilot may fly as a crewmember in air carrier service more than 100 hours during any 30 consecutive days.

(e) No pilot may fly as a crewmember in air carrier service more than 1,000 hours during any calendar year.

(f) Notwithstanding paragraph (a) of this section, an air carrier may, in conducting a transcontinental nonstop flight, schedule a flight crewmember for more than eight but not more than 10 hours of continuous duty aloft without an intervening rest period, if

(1) The flight is in an airplane with a pressurization system that is operative at the beginning of the flight;

(2) The flightcrew consists of at least two pilots and a flight engineer; and

(3) The air carrier uses, in conducting the operation, an air/ground communication service that is independent of systems operated by the United States, and a dispatch organization, both of which are approved by the Administrator as adequate to serve the terminal points concerned.

Paragraph 121.507, Flight time limitations: three pilot crews: airplanes, states:

(a) No supplemental air carrier or commercial operator may schedule a pilot

(1) For flight deck duty in an airplane that has a crew of three pilots for more than eight hours in any 24 consecutive hours; or

(2) To be aloft in an airplane that has a crew of three pilots for more than 12 hours in any 24 consecutive hours.

(b) No pilot of an airplane that has a crew of three pilots may be on duty for more than 18 hours in any 24 consecutive hours.

Paragraph 121.513, Flight time limitations overseas and international operations airplanes states:

In place of the flight time limitations paragraphs 121.503 through 121.511, a supplemental air carrier or commercial operator may elect to comply with the flight time limitations of paragraphs 121.515 and 121.521 through 121.525 for operations conducted

- (a) Between a place in the 48 contiguous States and the District of Columbia, or Alaska, and any place outside thereof,
- (b) Between any two places outside the 48 contiguous States, the District of Columbia, and Alaska; or
- (c) Between two places within the State of Alaska or the State of Hawaii.

Additionally, paragraph 121.517, Flight time limitations: other commercial flying: airplanes, states:

No airman who is employed by a supplemental air carrier or commercial operator may do any other commercial flying, if that commercial flying plus his flying in operations under this part will exceed any flight time limitation in this part.

Paragraph 121.521, Flight time limitations: Crew of two pilots and one additional airman as required, states:

- (a) No supplemental air carrier or commercial operator may schedule an airman to be aloft as a member of the flightcrew in an airplane that has a crew of two pilots and at least one additional flight crewmember for more than 12 hours during any 24 consecutive hours.
- (b) If an airman has been aloft as a member of a flightcrew for 20 or more hours during any 48 consecutive hours or 24 or more hours during any 72 consecutive hours, he must be given at least 18 hours of rest before being assigned to any duty with the air carrier or

commercial operator. In any case, he must be relieved of all duty for at least 24 consecutive hours during any seven consecutive days.

(c) No airman may be aloft as a flight crewmember more than:

- (1) 120 hours during any 30 consecutive days; or
- (2) 300 hours during any 90 consecutive days.

Paragraph 121.525, Flight time limitations: Pilots serving in more than one kind of flightcrew, states:

(a) This section applies to each pilot assigned during any 30 consecutive days to more than one type of flightcrew.

(b) The flight time limitations for a pilot who is scheduled for duty aloft for more than 20 hours in two-pilot crews in 30 consecutive days, or whose assignment in such a crew is interrupted more than once in any 30 consecutive days by assignment to a crew of two or more pilots and an additional flight crewmember, are those listed in paragraphs 121.503 through 121.509, as appropriate.

(c) Except for a pilot covered by paragraph (b) of this section, the flight time limitations for a pilot scheduled for duty aloft for more than 20 hours in two-pilot and additional flight crewmember crews in 30 consecutive days or whose assignment in such a crew is interrupted more than once in any 30 consecutive days by an assignment to a crew consisting of three pilots and an additional flight crewmember, are those set forth in paragraph 121. 521.

(d) The flight time limitations for a pilot to whom paragraphs (b) and (c) of this section do not apply, and who is scheduled for duty aloft for a total of not more than 20 hours within 30 consecutive days in two-pilot crews (with or without additional flight crewmembers) are those set forth in paragraph 121.523.

(e) The flight time limitations for a pilot assigned to each of two-pilot, two-pilot and additional flight crewmember, and three-pilot and additional flight crewmember crews in 30 consecutive days,

and who is not subject to paragraph (b), (c), or (d) of this section, are those listed in paragraph 121.523.

The supervisory crew scheduler for AIA stated that it is the company's policy to permit scheduling of a crewmember to perform "not more than 24 hours of duty time," at any one time. Accordingly, the scheduler also stated that this type of scheduling is determined by the company and not by the FARs.

Additionally, the AIA General Operating Manual (GOM) identifies a company practice that involves the ferrying of an airplane on a non revenue flight under 14 CFR Part 91. This practice is also known as "tail end ferry," because the ferry flight may occur at the completion of a revenue flight, and is a means of repositioning the airplane for either the next revenue flight or return to the base of operation. The FAA determined that the flight time limitations contained in 14 CFR Part 121 no longer apply after completion of the Part 121 segment of the trip. Because there are no limitations specified in 14 CFR Part 91, a Part 91 flight can be initiated even though the time that would be accrued before completion of that flight would exceed that permitted under Part 121.¹⁵

The manager of the FAA Air Carrier Branch provided testimony at the Safety Board public hearing regarding ferry flights being conducted under 14 CFR Part 91. He stated:

...the most immediate concern [of the FAA] is the other commercial flying loophole that exists in the supplemental rules that permits these post Part 121 ferry flights to be conducted under Part 91. We need to close that loophole.... We are also concerned about the clarity and the possible ambiguity of certain requirements in the supplemental rules.

1.17.10 Flightcrew Fatigue

An evaluation of the flightcrew fatigue factors and their relationship to the operation of flight 808 was conducted at the request of the Safety Board by members of the NASA-Ames Research Center Fatigue Countermeasures Program,

¹⁵Federal Aviation Decisions, Chief Counsel Interpretations, 1992-1, pertaining to 14 CFR Part 121.521(a) and 121.523(a).

one of the leading research programs on fatigue in the United States. The results of this report are included as appendix E.

In their examination of the fatigue factors, which included studying the sleep/wake histories of the three flightcrew members of flight 808, the researchers discussed the effects of sleep and circadian rhythms on a person's performance abilities and capabilities. The following information is excerpted from the researchers report:

Flight operations can engender sleep loss and circadian disruption that can affect flightcrew performance, vigilance, and mood. Scientific information on sleep and circadian rhythms acquired over the past 40 years has clearly established human requirements for sleep and the detrimental effects of sleep loss and circadian disruption....

Historically, sleep has been viewed as a state when the human organism is turned off. Scientific findings have clearly established that sleep is a complex, active physiological state that is vital to human survival. Like human requirements for food and water, sleep is a vital physiological need. When an individual is deprived of food and water, the brain provides specific signals - hunger and thirst.... Similarly, when deprived of sleep, the physiological response is sleepiness.... At the onset of sleep, an individual disengages perceptually from the external environment, essentially ceasing to integrate outside information...a microsleep [a spontaneous sleep episode lasting only seconds] can be associated with a significant performance lapse when an individual does not receive or respond to external information. With sleep loss, these uncontrolled sleep episodes can occur while standing, operating machinery, and even in situations that would put an individual at risk, such as driving a car....

Sleep loss creates sleepiness and often is dismissed as a minimal nuisance or easily overcome. However, sleepiness can potentially degrade most aspects of human capability.... Sleepiness can be associated with decrements in decision-making, vigilance, reaction time, memory, psychomotor coordination, and information processing (e.g. fixation on certain material to the detriment of other

information).... Research has demonstrated that with increased sleepiness, individuals demonstrate poorer performance despite increased effort, and may report indifference regarding the outcome of their performance. Individuals report fewer positive emotions, more negative emotions, and an overall worsened mood with sleep loss and sleepiness....

Generally, sleepiness can degrade most aspects of human waking performance, vigilance and mood.... However, in many other situations, while the individual may not actually fall asleep, the level of sleepiness can still significantly degrade the human performance. For example, the individual may react slowly to information, may incorrectly process the importance of the information, may find decision making difficult, may make poor decisions, may have to check and recheck information or activities because of memory difficulties. This performance degradation can be a direct result of sleep loss and the associated sleepiness and can play an insidious role in the occurrence of an operational incident or accident....

Humans, like other living organisms, have a circadian clock in the brain that regulates physiological and behavioral functions on a 24 hour basis.... When the circadian clock is moved to a new work/rest (or sleep/wake) schedule or put in a new environmental time zone, it does not adjust immediately. This is the basis for the circadian disruption associated with jet lag. Once the circadian clock is moved to a new schedule or time zone, it can begin to adjust and may take from several days up to several weeks to physiologically adapt.... There are some specific factors that can affect the circadian clock's adaptation. Day/night reversion can confuse the clock so that the cues that help it adjust and maintain its usual physiological pattern are disrupted. Moving from a day to night schedule and back to days can keep the clock in a continuous state of readjustment, depending on the time between schedule changes....

Scientific studies have revealed that there are two periods of maximal sleepiness during a usual 24-hour day. One occurs at night roughly between 3 and 5 AM, and the other in midday roughly between 3 and 5 PM. Individuals on a regular day/night schedule

will typically sleep through the 3-5 AM window of sleepiness. The afternoon sleepiness period can be masked by factors described previously....

Based on the previous scientific information regarding sleep and circadian rhythms, there are at least three core physiological factors to examine when investigating the role of fatigue in an incident or accident. The first is cumulative sleep loss. An individual's usual sleep amount is established based on the reported total sleep time at home.... The second factor is the continuous hours of wakefulness prior to the incident or accident. A general sleep/wake pattern will have an individual awake for about 16 hours and sleep for about 8 hours. However, operational requirements can involve extended duty periods that require continuous hours of wakefulness beyond this usual pattern. The third factor is time of day. This involves the time of operations and the time at which the incident or accident occurred....

The greatest decrement would be expected when an individual carrying a substantial sleep debt is required to operate for an extended period of continuous wakefulness, and the time of the operation passes through a period of increased sleepiness....

The researchers found in their study of the crewmembers' sleep/wake periods that in the 28.5 hour period prior to the accident, the cumulative totals for sleep and wakefulness for the captain, first officer, and flight engineer were: 23.5 hours awake with 5 hours of sleep, 19 hours awake with 8 hours of sleep, and 21 hours awake with 6 hours of sleep, respectively. (See figures 3 and 4).

The crew had been on duty for about 18 hours at the time of the accident, having flown all night before accepting the new flight segment to Guantanamo. The captain stated that he felt tired on the morning when he accepted the trip to Guantanamo, after having flown all night on his scheduled trip, but said that he was not so tired that he considered it unsafe for him to fly.

In his testimony at the Safety Board's public hearing, the captain described his memory of the last period before the accident in terms that suggested fatigue:

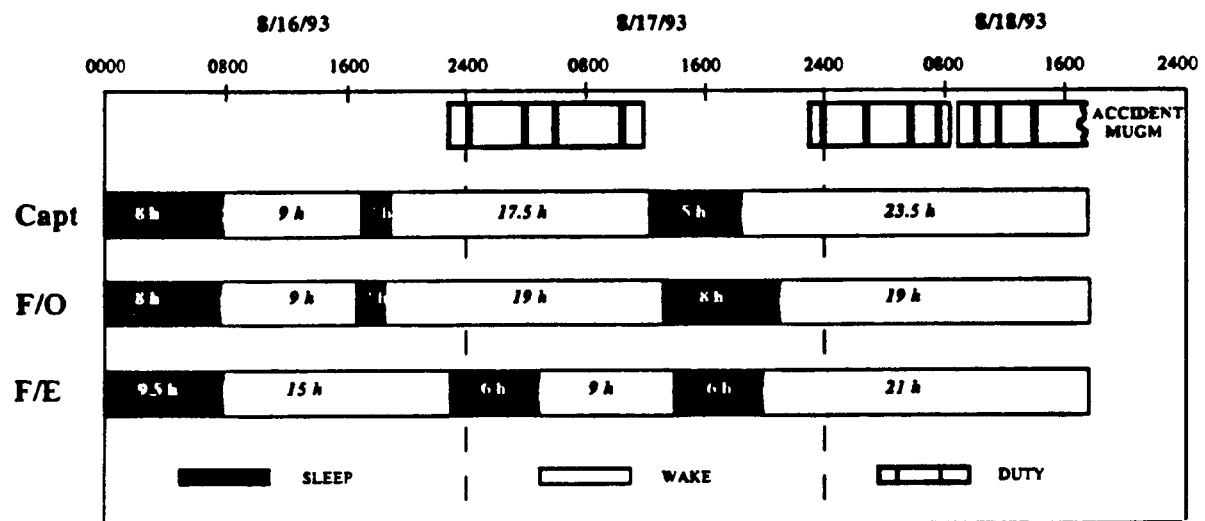


Figure 3.--Flightcrew sleep/wake histories.

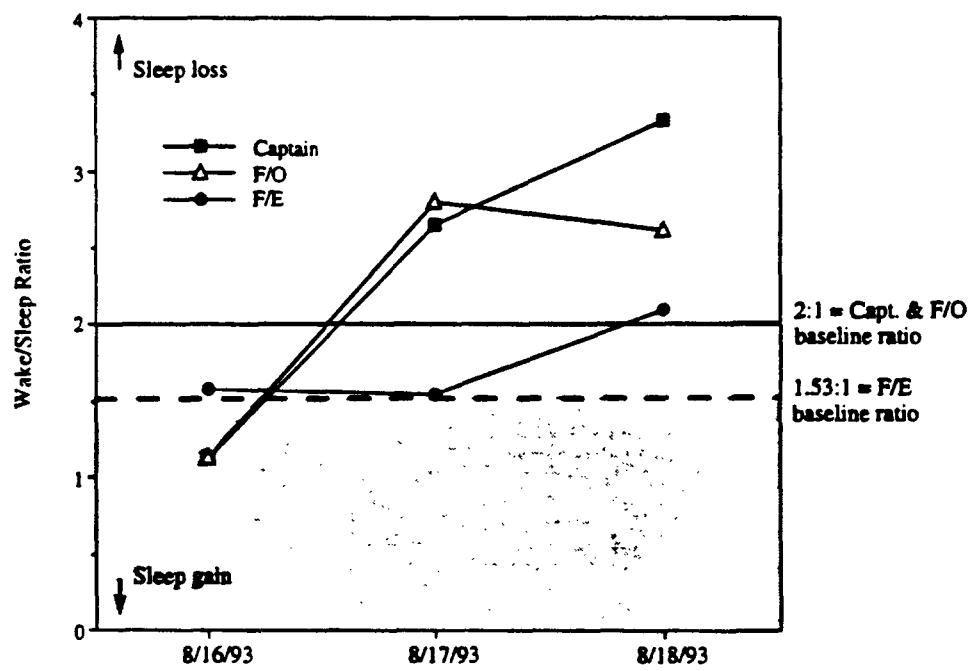


Figure 4.--Flightcrew cumulative sleep/wake debt.

All I can say is that I was -- I felt very lethargic or indifferent. I remember making the turn from the base to the final, but I don't remember trying to look for the airport or adding power or decreasing power.

On final -- I had mentioned...that I had heard Tom say something about he didn't like the looks of the approach. And looking at the voice recorder, it was along the lines of, are we going to make this?

I remember looking over at him, and there again, I remember -- being very lethargic about it or indifferent. I don't recall asking him or questioning anybody. I don't recall the engineer talking about the air speeds at all. So it's very frustrating and disconcerting at night to try to lay there and think of how this -- you know -- how you could be so lethargic when so many things were going on, but that's just the way it was.

One of the NASA researchers performing the fatigue study of the crew of flight 808, stated in his testimony at the Safety Board's public hearing:

The third important point I think is that we don't usually take sleepiness seriously, but sleepiness during our waking hours can essentially affect every aspect of human capability and performance.... A few of those things like decision making. So with sleep loss, people would have problems making decisions. People who otherwise would make fine decisions deciding among three alternatives, could go with the worst one. They don't process critical information very well.

Reaction time can be degraded. Again, it's not an extreme case when you're asleep.... People get tunnel vision. They can literally focus on one piece of information to the exclusion of other kinds of information....

In his testimony, the NASA expert provided the following characterization of the captain's performance, as it related to fatigue:

...The second is the fixation on the strobe light. I counted seven comments in the [CVR] transcript about the strobe.... I think what's

really critical about that is that...in sleep loss situations, you get people with tunnel vision. They get fixated on a piece of information to the exclusion of other things.... The other thing is right in the middle of that, he [the captain] disregards a critical piece of information...the first officer or flight engineer -- someone saying, "I don't know if we're going to make this"... So besides just fixating, you've got disregard for a critical piece of information....

A second piece of evidence, as I said was the captain...his being "lethargic and indifferent." I think that lethargic just tells you he was tired, fatigued.... One of the findings in sleep deprivation studies is that people will put in more effort, in spite of the fact that their performance goes down, but they don't care what happens. That's indifference....